



(11) Japanese Unexamined Patent Application Publication No.
4-292239

(43) Publication Date: October 16, 1992

(21) Application No. 3-56929

(22) Application Date: March 20, 1991

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(54) [Title of the Invention] VEHICULAR AIRBAG

(57) [Abstract] (amended)

[Object] To reduce the capacity of an airbag used for a front passenger seat and a rear seat, and to simplify the manufacture of the airbag.

[Solving Means] In a vehicular airbag, a loop is formed of bag bodies 2 and 3 and a cloth-like material 4 with both ends thereof connected to each other, a piece of strip cloth 8 is wound on the circumference of a bag body cross section of the loop, and gas is injected into the bag body from a gas generator. When the bag body is inflated, the bag body is bent into two parts by means of the strip cloth, whereby the cloth-like material is developed to form a plane, and the plane surface receives an occupant.

[Claim]

[Claim 1] A vehicular airbag in which both ends of a bag body are connected to each other by a cloth-like material and formed in a loop, a strip cloth is wound around the periphery of a cross section of the bag body, the bag body is restricted by the strip cloth, the bag body is in a bent shape when the airbag is developed, and a gas generator mounting part is provided on a part of the bag body.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention] The present invention relates to an airbag for protecting an occupant of a vehicle, in particular, a vehicular airbag for a front passenger seat and a rear seat of a large capacity.

[0002]

[Description of the Related Art] In recent years, an airbag system has been put into practical use as an occupant protective safety device for preventing human damages accompanied with accidents of various kinds of means of transportation, in particular, automobiles, and has been equipped on the automobiles or the like. The above-described airbag system comprises a sensor to detect the collision of an automobile, an inflator to inflate an airbag by the signal from the sensor, and the airbag to absorb the collision energy of an occupant.

[0003] The parts of equipping the airbag system are expanded from a driver's seat in an original part, to a front passenger seat, and further to a rear seat. Among these parts, the front passenger seat and the rear seat are intended for a plurality of occupants, and the space to a storage place of the airbag system is large, and the capacity of two to four times the capacity of the airbag for the driver's seat is usually required.

[0004] Thus, a large-sized inflator of large gas generation which is used for inflating the airbag of the capacity of two to four times larger than that for the airbag for the driver's seat is required, raising problems, in that not only the storage space of the entire airbag system is increased, but also the fuel consumption efficiency is degraded as the weight is increased. In addition, the airbag for the driver's seat has been manufactured (sewn) in a relatively simple manner by cutting, and sewing or adhering two cloths of the same shape.

[0005] However, for the airbag for the front passenger seat and the rear seat, the space is large, the distance of the airbag in a developed condition from the gas generator mounting part to the occupant colliding surface (hereinafter, referred to as "the depth") must be longer than that for the driver's seat, and the shape for filling the space becomes complicated. Thus, it is difficult to apply the method for

manufacturing the airbag for the driver's seat directly, and a three-dimensional bag body has been formed in the bag-manufacturing process. Manufacture of the three-dimensional airbag requires much labor and technology as shown in, for example, Japanese Unexamined Utility Model Registration Application Publication No. 62-69743, Japanese Unexamined Utility Model Registration Application Publication No. 48-31726, and Japanese Unexamined Utility Model Registration Application Publication No. 49-42636. Further, the technology is disclosed for other proposal to simultaneously ensure the low capacity and the satisfactory depth as disclosed in Japanese Unexamined Utility Model Registration Application Publication No. 49-84830, Japanese Unexamined Utility Model Registration Application Publication No. 48-110832, and Japanese Unexamined Patent Application Publication No. 47-30045. However, the shape thereof becomes complicated, and the manufacture of the airbag is difficult, raising problems.

[0006]

[Problems to be Solved by the Invention] An object of the present invention is to provide an airbag which has a shape capable of filling a space of a front passenger seat and a rear seat with a low capacity, and is manufactured by a simple bag-manufacturing method.

[0007]

[Means for Solving the Problems] In other words, the airbag of the present invention is a vehicular airbag which is formed in a loop by connecting both ends of a bag body by a cloth-like material, wherein a strip cloth is wound around the cross section of the bag body, and restricted by the strip cloth, the bag body is bent when being developed, and a gas generator mounting part is provided on a part of the bag body.

[0008] The vehicular airbag of the present invention will be described with reference to the drawings. Fig. 1 is a plan view to show the developed state of the airbag when mounted and viewed from an occupant side. Fig. 2 is a cross sectional view of the airbag cut at a right angle to the surface to receive an occupant. The bag bodies (2, 3) are joined with each other at both ends (5, 6) of the bag bodies by a cloth-like material (4) of a part to receive the occupant, and formed in a loop. The bag body is longitudinally squeezed and divided at a gas generator mounting part (1) by a strip cloth (8). In other words, the strip cloth is wound in the longitudinal direction of the bag body with the gas generator mounting part as a base point. Thus, when the airbag is inflated, the airbag is folded along the mounting part of the strip cloth to generate a bent shape.

[0009] Further, Fig. 3 is a side view from the occupant

side and shows an occupant receiving surface of a part corresponding to the cloth-like material in Fig. 1. Fig. 4 is a perspective view from the side opposite to the occupant side over the windshield, and shows a joining and restricting structure of the strip cloth (joined at both ends 8(a) and 8(b)) with a mounting port wound around the base point. Fig. 5 is a perspective view to show the state in which the cloth-like material after the bag is manufactured and before it is formed in the loop is not joined.

[0010] In the airbag of the present invention, the bag body is formed, and both ends of the bag body by the cloth-like material are connected to each other as described below. As shown in Fig. 5, the bag body is formed by overlapping two rectangular cloths of the same width and the different length while one end (5) thereof is arranged, and peripheral parts of the two overlapped cloths are joined (9) with each other while remaining the longer, not-overlapped cloth part (4). A loop is formed by joining an end (7) of the non-overlapped cloth-like material (4) with the other end (6) of the bag body.

[0011] In addition, a center portion of the bag body is squeezed narrow by winding the narrow strip cloth (8) therearound. The loop means a ring which is formed by connecting the bag body to one cloth-like material in a bag

manufacturing process. When gas is introduced into the bag body from the gas generator mounting part 1, the bag body is secured by the cloth-like material to connect both ends to each other and secured by the strip cloth, and the bag body is divided into two by a securing part and folded in a bent shape. In this condition, the cloth-like material is pulled by the securing force to bend the bag body, and expanded flat, and the expanded cloth-like material forms a suitable cushion to receive the occupant.

[0012] The vehicular airbag of the present invention has the above-described configuration, and the bag body can be bent by the presence of the cloth-like material and the strip cloth to connect both ends of the bag body to each other by introducing gas into the bag body from the gas generator mounting part when an accident of an automobile or the like occurs, and developing the bag body. By providing the bent part, the capacity of the bag body can be reduced, and a flat surface of the cloth-like material which is a human body receiving surface is excellently obtained.

[0013] Formation of the bag body and connection of both ends of the bag body by the cloth-like material may be realized by overlapping one cloth to form the folded portion to be the bag body, and other portions, i.e., non-overlapped portion is provided, and the non-overlapped portion may be formed of the cloth-like material. Further, the bag body

may be formed of two cloths of the same shape. Still further, the bag body may be formed of two cloths of the same shape, and both ends thereof may be joined with the cloth-like material.

[0014] Still further, when the bag body of the special shape is required, the bag body can be easily obtained by joining peripheral portion of two cloths of the same shape with each other. In a known practical airbag, a complicated and troublesome three-dimensional sewing is required. However, the plane sewing can be performed for the vehicular airbag of the present invention, and the airbag can be easily manufactured. Further, the strip cloth may be joined at the gas generator mounting part around the periphery of the bag body after the bag body and the gas generator mounting part are prepared, and the strip cloth can be easily mounted. Preferably, the strip cloth is fixed more firmly if at least one joining point is provided.

[0015] Further, the length of the strip cloth is preferably adjusted adequately according to the peripheral length of the mounted bag body. The length of the development in the direction of the occupant is preferably controlled reliably for controlling the gas capacity by restricting the height and the shape of a bent part after the bag body is inflated, or for preventing any unnecessary projection to the occupant (the so-called knockout phenomenon).

[0016] However, if the strip cloth is extremely short, the introduction property of gas ejected from the gas generator is degraded. If the strip cloth is long, the space for introducing gas is increased, the gas introduction property becomes smooth, breakage of the bent part is less, and any swell of the bent part is larger, demonstrating the effect that the energy absorption when collided with a human body is increased. If the strip cloth is too long, the internal capacity of the bag body is increased, which is not preferable. The length of the strip cloth is preferably adjusted to be adequate. The width of the strip cloth is not limited.

[0017] The shape of the bag body and the cloth-like material of the vehicular airbag of the present invention includes a polygonal shape such as rectangular and triangular, circular, elliptical or the like, which is not limited so long as the loop shape to be locally bent when developed is obtained, and a human body receiving surface is formed. The joining method of the present invention may include binding, adhesion with adhesive, melt-bonding of cloths to each other, weaving and knitting, and joining of an outer peripheral part of the bag body, or the joint use of these methods.

[0018] The position of mounting the airbag constituted of the bag body and the cloth-like material of the present

invention on a vehicle or the like is the position of the gas generator mounting part or may be any of a ceiling, an upper part, a front part or a lower part of an instrument panel, and the rear seat by adequately changing the shape of the bag body or the cloth-like material. Gas-permeability of a material of the bag body part to be used for the vehicular airbag of the present invention is not limited. Even when the bag body is non-permeable, gas is enclosed therein, and gas is not leaked outside, the cloth-like material to form the human body receiving surface can demonstrate an adequate shock-absorbing effect. On the other hand, even when the bag body is gas-permeable, the bag body itself demonstrates the shock-absorbing effect. Thus, the gas permeability may be adequately selected according to the object.

[0019] The cloth used for the vehicular airbag of the present invention may satisfy preparation of the bag body part and the cloth-like material, the development property, the dynamic characteristic, and the durability of the bag, absorptivity of the collision energy of the occupant, or the like, and the material of the cloth may be adequately selected from knit, textile, non-woven textile, film, or the compound thereof. Further, the yarn to constitute the cloth includes ones of chemical fiber, inorganic fiber or the like obtained from the melt spinning, dry spinning, wet spinning

or the like, and these may be used singly or in a combined manner.

[0020] In the vehicular airbag of the present invention, both ends of the bag body are connected in a loop-shape by the cloth-like material, and if gas is ejected into the bag body from the gas generator mounting part provided on the bag body when an accident of an automobile or the like occurs, and filled in the bag body, the swollen bag body is restricted and bent because both ends of the bag body are connected by the cloth-like material. Further, during the swelling, the swelling of the bag body is restricted because the strip cloth is wound around the gas generator mounting part in a vicinity of the center, and the bag body is bent at the part of the strip cloth. When the cloth-like material connecting both ends of the bag body is used for the part to receive the occupant, the bag body forms a suitable cushion, and a flat surface to realize a wide receiving area.

[0021] In addition, in the case of the airbag of the entire surface base cloth exhaust type while the material of the bag body is gas-permeable, the bag body part does not receive the occupant, and hot gas from the gas generator does not attach the face or the like of the occupant directly. Further, as described above, the airbag of the present invention is bent, and the capacity of the bag body

part can be reduced. By joining the strip cloth with the mounting port of the gas generator to form the bent shape, the reinforcing effect nearby can be achieved. Further, by changing the winding position of the strip cloth, the overall external shape and the angle formed between the flat surface formed of the cloth-like material forming the human body receiving surface and the occupant can be changed.

[0022]

[Embodiment] The present invention will be described in detail with reference to the embodiment. The capacity of the airbag is measured by the following method. The airbag sealed to prevent any leakage from a joined part is immersed in a water tank, water is poured inside the airbag from the gas generator mounting part, and the capacity of the airbag is determined by obtaining the amount (liter) of flow-in water at the water column of 500 mm.

[0023]

[Embodiment 1] Nylon 66 fiber 420d/70f is used for warp and weft, and a plain fabric is formed, in which the warp density and the weft density are 46 pieces/inch. Next, chloroprene rubber is dissolved in toluene, and coated on one side of the plain fabric to obtain a coating cloth with the solid coating of 50g/m².

[0024] The obtained coating cloth is cut into a rectangular cloth of the width of 70cm and the length of 350cm, and

folded and overlaps at the position of 140 cm in the longitudinal direction, outer periphery of the part of 140 cm with the overlapped cloths being doubled is sewn to form the bag body parts (2, 3). Next, the remaining part of the width of 70 cm and the length of 70 cm which is not double-overlapped forms the cloth-like material (4) (the occupant receiving surface), and the line in the width direction at the end (7) of this cloth-like material and the line is joined with the line of the initially double-folded part (6) on one side to form a bag-shaped part. Thus, the coating cloth is the looped cloth constituted of the bag-shaped part and one cloth.

[0025] Next, the hole (1) for the gas generator mounting part is opened only in one side of a loop-shaped outer part at the intersection of the diagonals of the bag body, the bag-shaped cloth (8) of the length of 80 cm and the width of 5 cm is wound through the center of the hole and along the line in the width direction of the bag-shaped parts (2 and 3), and the ends (8(a) and 8(b)) of the strip cloth are sewn at the gas generator mounting part. The depth of development is 63 cm, the width is 68 cm, the height is 63 cm, and the capacity is 130 liter.

[0026]

[Comparison 1] Regarding the size of the cylindrical airbag in a developed mode which is put into practical use, the

depth is 63 cm, the width is 66 cm, the height is 61 cm, and the capacity is 200 liter. Thus, in the vehicular airbag of the present invention, the same depth can be obtained even when the capacity is small in comparison with a known airbag.

[0027]

[Table 1]

	Embodiment 1	Comparison 1
Capacity (l)	130	200
Depth (cm)	63	63

[0028]

[Advantages] The airbag of the present invention has a sufficient depth while small in capacity, and suitable of the front passenger seat and the rear seat. The airbag has no complicated three-dimensional joining, and is capable of performing the plain joining and easily manufactured. Further, by changing the position of mounting the gas generator on the bag body, a collision part of the occupant can be adequately selected, and a mounting part is adaptable to any of an upper part, a front part and a lower part of an instrument panel, and the rear seat. In addition, the part of receiving the occupant is a cloth-like part other than the bag body. Since the flat surface is obtained, the receiving area is large, and damages on the human body are less because hot gas does not attach a face or the like directly.

[Brief Description of the Drawings]

[Fig. 1] Fig. 1 is a plan view of an airbag developed in a mounted condition directly from the above.

[Fig. 2] Fig. 2 is a cross sectional view of the vehicular airbag developed in a mounted condition which is cut at a right angle to the surface to the surface to receive the occupant (horizontally at the gas generator mounting port).

[Fig. 3] Fig. 3 is a side view on the occupant receiving side.

[Fig. 4] Fig. 4 is a perspective view viewed from the windshield side opposite to the occupant receiving side.

[Fig. 5] Fig. 5 is a perspective view to show the uncoupled state of the cloth-like material of the airbag coupled in a loop shape.

[Reference Numerals]

- 1: gas generator mounting part
- 2,3: bag body
- 4: cloth-like material
- 5,6: both ends of bag body
- 7: end of cloth-like material
- 8: strip cloth
- 8(a), 8(b): strip cloth joined end
- 9: stitch